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OVERNIGHT DELIVERY

DEPARTMENT OF THE AIR FORCE
377th Civil Engineer Division (AFMC)

20 Apr 09

MEMORANDUM FOR MR. WILLIAM C. OLSON, CHIEF
GROUNDWATER QUALITY BUREAU (GWQB)
NEW MEXICO ENVIRONMENT DEPARTMENT (NMED)
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SANTA FE NM 87502

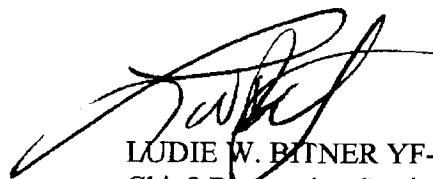
FROM: 377 MSG/CEANR
2050 Wyoming Blvd, S.E.
Building 20685, Suite 116
Kirtland AFB, NM 87117-5270

SUBJECT: Stage 2 Abatement Plan, Extraction Well KAFB-ST-105- EX-01 Aquifer Test
Report for Nitrate Contaminated Groundwater, Kirtland Air Force Base (AFB), NM

1 The Natural Resource Management Branch at Kirtland AFB (KAFB) is submitting the subject report. The report documents the second aquifer test completed on Extraction Well EX-01, as part of our aquifer and extraction well reevaluation, as specified in the revised schedule submitted for the Stage 2 Abatement Plan. An electronic copy of the report is included for your records.

2. This has been discussed with Mr. Bart Faris of your staff.

3. If you have any questions, please do not hesitate to contact me at (505) 853-3484 or Mark Holmes at (505) 846-9005.


LUDIE W. BITNER YF-02
Chief, Restoration Section

Attachments:

1. Aquifer test report
2. Electronic copy of the Aquifer test report

cc:

NMED GWQB, Mr. Faris w Atchs

NMED HWB, Mr. Kieling w Atch 2 only

NMED HWB, Mr. McDonald w Atchs

SNL, Mr. Skelly w Atchs

CH2M, Mr. Johnston w Atchs

USEPA-Region 6 (6PD-N), Ms. King w/o Atchs

HQ AFMC/A7CVQ, Mr. Fort w/o Atchs

AFCEE/EXEC, Ms. Doll w/o Atchs

MWH, Ms Drain w/o Atchs

Admin. Record, CNM, Montoya Campus w Atch 2 only

AR/IR w Atch 2 only

File w Atchs

KIRTLAND AIR FORCE BASE NEW MEXICO

STAGE 2 ABATEMENT PLAN
EXTRACTION WELL KAFB-ST105-EX01
AQUIFER TEST REPORT
FOR NITRATE CONTAMINATED GROUNDWATER AT
KIRTLAND AIR FORCE BASE, NEW MEXICO

April 2009



**377 MSG/CEVR
2050 Wyoming Blvd. SE
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MWH

21 April 2009

Kirtland Air Force Base
377 MSG/CEVR
2050 Wyoming Blvd SE, Building 20685
Suite 122
Kirtland AFB, NM 87117

Attention: Mr. Mark Holmes, Kirtland AFB Project Manager

Subject: SWMU ST105-EX01 Interim Stage 2 Abatement Plan Plume 1 Aquifer Test
Report at Kirtland Air Force Base, New Mexico

Contract No.: FA8903-04-D-8674, Delivery Order No. 006

Dear Mr. Holmes:

This letter report presents the results of the aquifer testing performed at extraction well KAFB-ST105-EX01 to support corrective action decisions related to nitrate contaminated groundwater at Kirtland Air Force Base (AFB), New Mexico. The aquifer testing was conducted under the Air Force Center for Engineering and the Environment (AFCEE) Contract FA8903-04-D-8674, Delivery Order No. 006. All field activities performed during aquifer testing were in compliance with the *Kirtland Air Force Base, Base-Wide Plans for the Environmental Restoration Program* (Kirtland AFB, 2004 update).

If you have any questions or concerns regarding this letter report, please contact me at (801) 617-3221.

Sincerely,

MWH

Deborah Drain
Client Service Manager

cc: Kristie Doll, AFCEE
Douglas Oliver, MWH SLC-1
File

DOCUMENT CERTIFICATION
APRIL 2009

I certify that this document is cleared for public release in accordance with Department of Defense Directives and Air Force Instructions.



Kirtland Air Force Base Public Affairs

377ABW-2009-0926

CONTENTS

Section	Page
1.0 INTRODUCTION.....	1-1
1.1 Background	1-1
1.2 Objectives.....	1-4
1.3 Approach.....	1-4
1.4 Report Organization	1-5
2.0 AQUIFER TESTING AND ANALYSIS PROCEDURES.....	2-1
2.1	
2.1.1 Background Test	2-2
2.1.2 Step Test.....	2-3
2.1.3 Constant Rate Test	2-3
2.1.4 Recovery Test.....	2-3
2.2 Data Analysis	2-4
2.2.1 Water-Level Data Corrections	2-4
2.2.2 Aquifer Test Analysis	2-4
2.3 Investigation Derived Waste	2-5
3.0 AQUIFER TEST RESULTS.....	3-1
3.1 Background Test	3-1
3.2 Step Test.....	3-1
3.3 Constant Rate Test	3-3
3.4 Recovery Test.....	3-6
3.5 Aquifer Characteristics.....	3-6
4.0 CONCLUSIONS AND RECOMMENDATIONS.....	4-1
4.1 Conclusions	4-1
4.2 Recommendations	4-1
REFERENCES	R-1

TABLES

Table	Page
Table 1-1. Extraction Well Drilling Summary	1-3
Table 1-2. Extraction Well Construction Details	1-3
Table 2-1. Observation Wells and Pumping Well Construction Details	2-1
Table 2-2. Aquifer Test Water Level Monitoring Frequencies	2-2
Table 3-1. KAFB-ST105-EX001 Step Test Results (15 January 2009).....	3-1
Table 3-2. Aquifer Test Results.....	3-6

FIGURES

Figure	Page
Figure 1-1. Plume 1 Extraction Well KAFB-ST105-EX01 and Monitoring Well Locations	1-2
Figure 3-1. KAFB ST-105 EX001 Step Drawdown Test (15 January 2009)	3-2
Figure 3-2. Water Levels in KAFB-ST105-EX01 During the Constant Rate and Recovery Tests	3-4
Figure 3-3. Water Levels in KAFB-0508 During the Constant Rate and Recovery Tests	3-4
Figure 3-4. Water Levels in KAFB-0507 During the Constant Rate and Recovery Tests	3-5
Figure 3-5. Water Levels in KAFB-0523 During the Constant Rate and Recovery Tests	3-5
Figure 3-6. Cooper Jacob Method of Analysis of KAFB-ST105-EX01 Drawdown Data	3-7
Figure 3-7. Theis Method of Analysis of KAFB-0508 Drawdown and Recovery Data	3-8

ATTACHMENTS

Attachment A	Aquifer Test Field Forms and Field Notes
Attachment B	KAFB Landfill Permit for IDW Disposal
Attachment C	KAFB Groundwater Discharge Authorization

1.0 INTRODUCTION

This letter report presents the results of the aquifer testing performed in January 2009 as part of the Plume 1 Corrective Measures Implementation (CMI) for the Interim Stage 2 Abatement Plan for Solid Waste Management Unit (SWMU) ST-105 at Kirtland Air Force Base (KAFB), New Mexico. This aquifer test was performed by MWH Americas, Inc (MWH) on behalf of KAFB under the Air Force Center for Engineering and the Environment (AFCEE) Contract FA8903-08-D-8777, Task Order (TO) 006.

1.1 Background

Extraction well KAFB-ST105-EX01 was installed in April 2007 for the Environmental Compliance Program (ECP) pilot study performed under contract number F41624-03-D-8608, Delivery Order 06, Modification 3. The objective of installing this well was to capture Plume 1 nitrate contaminated groundwater as part of the ST-105 Interim Stage 2 Nitrate Abatement Plan for ST-105. As shown in Figure 1-1, the extraction well is located at the leading edge of Plume 1 where elevated nitrate concentrations are consistently above the New Mexico Water Quality Control Commission (NMWQCC) standard of 10 milligrams per liter (mg/L) (20 New Mexico Administrative Code [NMAC] § 7.1). Additionally, this well is upgradient of production wells KAFB-7 and KAFB-16. The extraction well was screened within the upper 100 feet of the regional aquifer where the highest nitrate concentrations have been detected. Below this depth, nitrate concentrations decrease to below groundwater quality standards.

During extraction well installation, two drilling techniques were used due to well depth: air rotary casing hammer (ARCH) and mud rotary. ARCH was used to drill a pilot boring to total depth to collect groundwater samples to determine the vertical nitrate concentration for well screen placement. After completion of ARCH drilling, mud rotary was used to increase the diameter of the pilot boring for subsequent well construction. The drilling and extraction well construction information are listed below in Tables 1-1 and 1-2, respectively. During both ARCH and mud rotary drilling, it was noted that the boring was not producing as much water as typically observed in the regional aquifer in this area of KAFB.

The extraction well was initially developed over a period of seven days in April 2007 using swabbing, bailing, and surging techniques. Because low well yield continued to be observed using physical well development techniques, the well was dosed twice with a chemical dispersant, NuWell 220 in an attempt to improve well yield. An aquifer test was performed in April 2007 following well development that yielded an unexpectedly low sustainable pumping rate of 18.5 gallons per minute (gpm) resulting in a calculated hydraulic conductivity of less than 1 foot per day (USAF, 2007).

Redevelopment of KAFB-ST105-EX01 was performed in August 2008 and included pumping, bailing, jetting, and application of sodium acid pyrophosphate (SAPP). SAPP is an inorganic dispersant designed to disperse clay particles and sediments so that they can be removed during well development. After the SAPP treatment was conducted, jetting and pumping were used to redevelop the screened interval. Redevelopment increased production capacity for KAFB-ST105-EX01, supporting the need to conduct an aquifer test to re-evaluate the pumping capacity of KAFB-ST105-EX01 and recalibrate the groundwater model for KAFB.

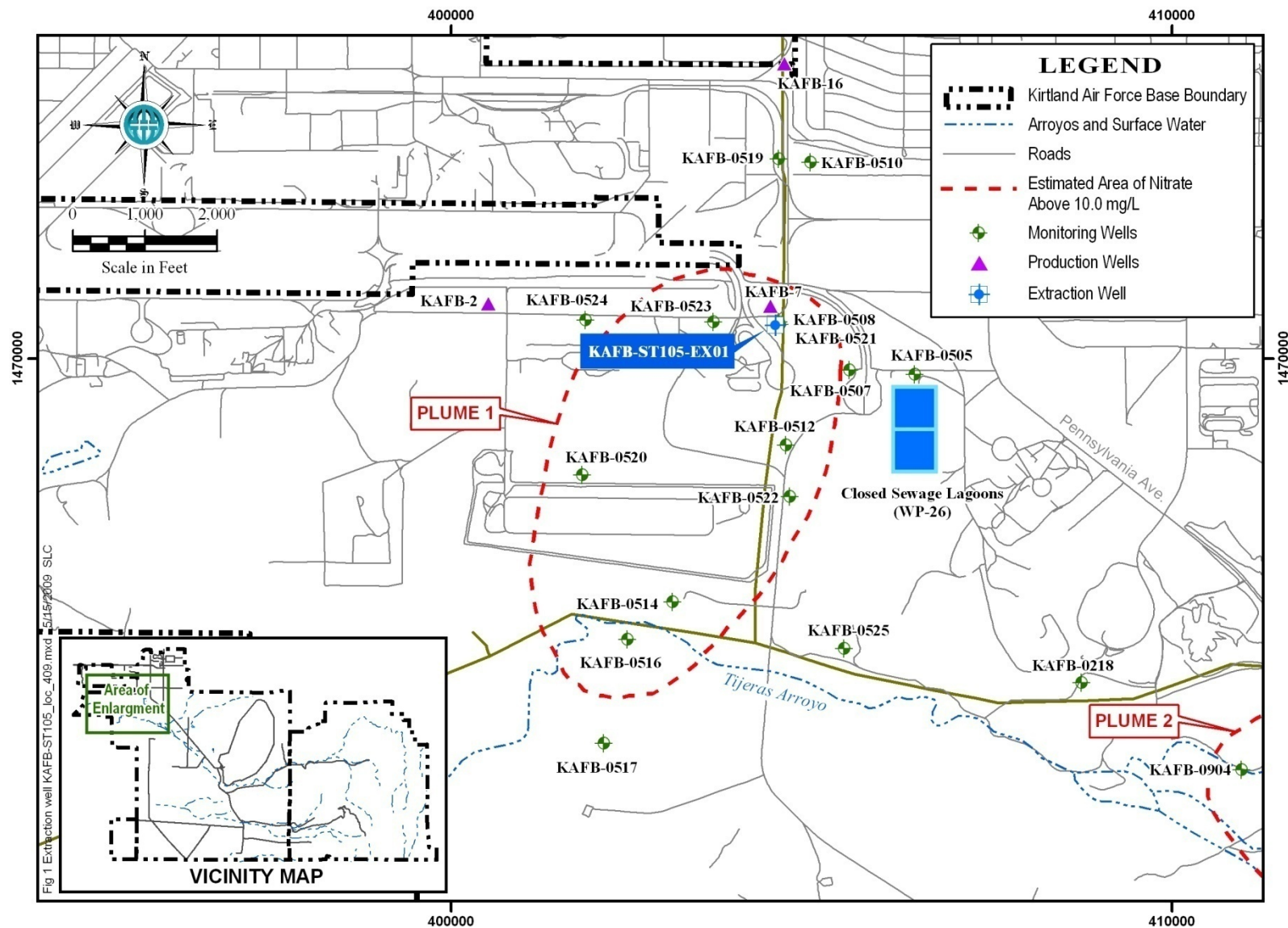


Figure 1-1. Plume 1 Extraction Well KAFB-ST105-EX01 and Monitoring Well Locations, Kirtland Air Force Base, New Mexico

Table 1-1 Extraction Well Drilling Summary

Drilling Method	Depth (ft bgs)	Drill Casing Diameter (inches)	Effective Boring Diameter (inches)
ARCH	0 - 300	11-3/4	12
ARCH	300 - 580	9-5/8	10
Mud Rotary	0 - 595	14	14
NA bgs ft	not applicable below ground surface feet		

Table 1-2 Extraction Well Construction Details

Construction Details	Depth (ft bgs)	Length (ft)	Material
Total boring depth	595	NA	NA
Depth to groundwater	495	NA	NA
Sump	585-575	10	Steel with welded 0.5 ft end cap
Screen	575-505	70	10-inch, 0.020-slot stainless steel
Well riser	505-ground surface +3 ft	508	10-inch welded steel
Filter Pack	595- 484.5	110.5	10/20 Silica sand
Barrier Sand	484.5-478.5	6	Frac-sand
Well Seal	478.5-431	47.5	3/8-inch bentonite chips
Well Seal	431-6	425	Portland cement with bentonite 3% by weight
Protective casing	0-20	20	18-inch diameter steel casing
Centralizers	40-ft centers	NA	Stainless steel
Surface completion	ground surface	NA	Temporary 4 x 4 x 1 ft cement pad Locking cover welded to well casing (painted yellow) 4-protective bollards (painted yellow)
NA ft bgs	Not applicable feet below ground surface		

The pilot study results are documented in the *Interim Stage 2 Abatement Plan Extraction Well Pilot Study Report for Nitrate Contaminated Groundwater at Kirtland Air Force Base, New Mexico* (USAF, 2007).

The pilot study recommendations were:

- To delay connecting extraction well KAFB-ST105-EX01 to the Golf Course Main Pond (GCMP) irrigation line due to the unexpectedly low sustainable pumping rate. At this time, the low sustainable pumping rate and subsequent limited impact of nitrate removal on Plume 1 did not warrant the capital cost of installation of the extraction well operating system, estimated at approximately \$600,000 in 2006 dollars. This cost did not include future operations and maintenance of the system.
- To collect additional hydraulic conductivity data to further assess whether groundwater extraction is a viable treatment alternative for Plume 1.
- To perform groundwater modeling for Plume 1 to collect additional information regarding nitrate migration to further assess the need for groundwater extraction.

Based on these recommendations, additional aquifer testing of extraction well KAFB-ST105-EX01 was performed in January 2009 to assess whether this well would support nitrate removal as part of the ST-105 Stage 2 Nitrate Abatement Plan.

1.2 Objectives

The aquifer test at KAFB-ST105-EX01 was performed to evaluate how redevelopment activities increased well yield and specific capacity, and to evaluate if groundwater extraction is a feasible interim-stabilization measure for dissolved-phase contaminants in groundwater. The aquifer test objectives were:

- Evaluate if pumping at KAFB-ST105-EX01 could create a capture zone (i.e., a hydraulic depression) that would reduce downgradient contaminant migration (i.e., provide containment of nitrate contaminated groundwater).
- Assess the connectivity (or lack thereof) of groundwater flow paths intersected by KAFB-ST105-EX01 and the observation wells.
- Estimate hydraulic properties and characteristics (e.g., hydraulic conductivity, transmissivity, storativity) of the nitrate contaminated zone of the regional aquifer.
- Evaluate if pumping KAFB-ST105-EX01 could remove significant contaminant (nitrate) mass.
- Evaluate if pumping would mitigate nitrate migration to KAFB-16 (a downgradient production well).

1.3 Approach

The aquifer testing was performed in accordance with the guidance presented in the following plans:

- *Final Base-Wide Plans for Investigations Under the Installation Restoration Program, 2004 Update, Kirtland Air Force Base, Albuquerque, New Mexico* (base-wide plans [BWP]) (USAF, 2004); and
- *SWMU ST-105 Stage 2 Abatement Plan Extraction Well KAFB-ST105-EX01 Aquifer Test Work Plan for Nitrate Contaminated Groundwater at Kirtland Air Force Base, New Mexico* (USAF, 2008).

The applicable procedures outlined in the BWP were followed for field activities unless specifically modified by the task-specific work plan. The KAFB Base-Wide Health and Safety Plan (Appendix F of the BWP) was also followed for all field activities unless specifically modified by the task-specific health and safety plan, included as an attachment to each of the task-specific work plan listed above.

1.4 Report Organization

The report is organized as follows:

- Section 2.0 describes the aquifer testing and analysis procedures.
- Section 3.0 presents the results of the aquifer testing.
- Section 4.0 presents the conclusions of the aquifer testing and recommendations for future work based on the results of the aquifer testing.

2.0 AQUIFER TESTING AND ANALYSIS PROCEDURES

2.1 Aquifer Testing Procedures

The KAFB-ST105-EX01 aquifer test included the following:

1. A background monitoring test,
2. A variable pumping rate (step) drawdown test,
3. A constant discharge rate test, and
4. A recovery test.

The aquifer tests included extraction well KAFB-ST105-EX01 and three monitoring wells, KAFB-0508, KAFB-0507, and KAFB-0523, that were used as the observation wells. The well locations are shown on Figure 1-1. The well completion details are provided in Table 2-1. Originally, production well KAFB-7 was to be used as an observation location; however, the transducer cables could not be lowered into the well due to the pump assembly.

The aquifer testing took place between 12 and 21 January 2009 in accordance with the procedures detailed in the *SWMU ST-105 Stage 2 Abatement Plan Extraction Well KAFB-ST105-EX01 Aquifer Test Work Plan for Nitrate Contaminated Groundwater at Kirtland Air Force Base, New Mexico (USAF, 2008)*; hereafter referred to as the Work Plan.

Table 2-1 Observation Wells and Pumping Well Construction Details

WELL ID	Measuring Point Elevation (ft)	Groundwater Depth (ft)	Groundwater Elevation (ft)	Top of Screen (ft)	Bottom of Screen (ft)	Well Diameter (in)	Northing	Easting	Total Depth (ft)
KAFB-ST105-EX01	5348.45	497.76	4850.69	505	575	10	1470463	404500	585
KAFB-0507	5356.15	502.05	4854.10	482.3	507.3	4	1469846	405526	512.3
KAFB-0508	5349.21	498.70	4850.51	481	506	4	1470510	404552	508
KAFB-0523	5347.84	493.42	4854.42	600	625	4	1470478	403574	627.5
ft feet in inches									

Aquifer Test Equipment and Data Collection. The following equipment were used for the aquifer test:

- A 25 horsepower (hp) Grundfos submersible pump was used for the step and constant rate tests. The pump was set at 574 feet (ft) below the measuring point (bmp) in extraction well KAFB-ST105-EX01.
- An In-situ® BAROTROLL was used to monitor barometric pressure during all testing. It was set 30 ft. below the measuring point in extraction well KAFB-ST105-EX01.

- In-situ® Level TROLLS® model 700 water-level transducers were used to record water-level responses during all tests. Transducers were set at 514 ft. bmp in monitoring well KAFB-0508, 515 ft bmp in monitoring well KAFB-0507, 513 ft bmp in monitoring well KAFB-0523, and 563 ft bmp in extraction well KAFB-ST105-EX01.
- Electric water-level sounders were used to collect manual depth to groundwater measurements during the testing in the event of transducer failure.

Water level measurements were collected electronically and manually as specified in the Work Plan and listed below in Table 2-2. Water levels were measured prior to the background, step, and constant rate testing using the manual water-level indicator and recorded on the aquifer test field forms. The manual water level readings were collected as scheduled in the Work Plan to determine pump and transducer probe placement.

The water-level response to aquifer testing was checked manually to confirm that the transducers were working correctly, to confirm that the initial response was not out of range relative to the theoretical water-level response, and that the aquifer response was reasonable. During the testing, transducer recorded water levels were evaluated routinely using the Win-situ® 5 software designed to work with the In-situ® Level TROLL®.

Table 2-2 Aquifer Test Water Level Monitoring Frequencies

Time Period (Hr)	Pre-Test	Step Test	Constant Rate Test	Recovery Test
0 to 0.5	10 min ^a once ^{b,c}	10 sec ^a 1 min ^b	10 sec ^a 1 min ^b 10 min ^c	10 sec ^a 1 min ^b 10 min ^c
0.5 to 1	10 min ^a	1 min ^a 5 min ^b	1 min ^a 5 min ^b 10 min ^c	1 min ^a 5 min ^b 10 min ^c
1 to 2	10 min ^a	5 min ^a 10 min ^b	5 min ^a 10 min ^{b,c}	5 min ^a 10 min ^{b,c}
2 to 8	10 min ^a	Repeat for each step	10 min ^a 30 min ^{b,c}	10 min ^a 30 min ^{b,c}
8 to 12	10 min ^a	NA	10 min ^a 1 hr ^{b,c}	10 min ^a 1 hr ^{b,c}
12 to 72	10 min ^a once each day ^{b,c}	NA	10 min ^a 4 hr ^{b,c}	10 min ^a 12 hr ^{b,c}
^a Pressure transducer/datalogger ^b Manual measurements in test well ^{b,c} Manual measurements in monitoring wells hr hour min minute NA not applicable sec second Note that water level monitoring only is required in the extraction well during the step test.				

2.1.1 Background Test

The purpose of the background test was to establish water-level baselines and to evaluate other potential causes of water-level changes not caused by pumping in KAFB-ST105-EX01 (e.g., long-term trends, barometric pressure changes, diurnal influences). Baseline water levels were monitored with Level

TROLL 700 transducers for approximately 72-hours prior to the pumping tests in KAFB-ST105-EX01, KAFB-0507, KAFB-0508, and KAFB-0523 (except KAFB-ST105-EX01 in which two days of transducer background water levels were collected). Water levels were measured every ten minutes with Level TROLLs during the background test in KAFB-ST105-EX01 and observation wells KAFB-0507, KAFB-0508, and KAFB-0523. Background monitoring began on 12 January 2009 and continued until 15 January 2009. Water levels also were measured manually with an electric water-level sounder on a daily basis during the background test.

Barometric pressure was also measured every ten minutes with a barometric-pressure transducer (BAROTROLL) during the background test, as well as during the step, constant rate discharge, and recovery tests. The barometric-pressure transducer was installed in monitoring well KAFB-ST105-EX01 approximately 30 feet below ground surface to minimize diurnal temperature variations, which could result in changes in measured barometric pressure due to heating and cooling of the pressure transducer rather than actual changes in atmospheric pressure. Manual water levels were collected during the entire testing program.

2.1.2 Step Test

A variable pumping rate drawdown test (hereafter referred to as a step test) was performed at KAFB-ST105-EX01 to determine if the well would yield sufficient water to perform a 72-hour constant rate discharge test and to establish the optimal pumping rate for the constant rate discharge test. The step test was performed on 15 January 2009 by pumping KAFB-ST105-EX01 at successively higher rates. Steps were performed at pumping rates of 25, 40, 53, and 55 gpm. Each step ran for approximately two hours each. Based on existing site data it was anticipated that the maximum pumping rate would not exceed 45 gpm; however, based on the results of the step test it was determined that the sustainable pumping rate would exceed 45 gpm. KAFB was notified of the higher pumping rate and approval was granted to run the pump at a rate higher than specified in the Work Plan. Manual and electronic measurement frequencies complied with the Work Plan.

2.1.3 Constant Rate Test

KAFB-ST105-EX01 was pumped at a constant rate of 53 gpm (determined by the step test) for 73 hours during the constant rate test from 13:00 MST on 16 January 2009 and ending at 14:00 MST on 19 January 2009. Following the step test and prior to the start of the constant rate test, the water level in KAFB-ST105-EX01 was allowed to recover to 99.9 percent of its pre-pumping level (prior to step testing). During the constant rate test, water levels were monitored in KAFB-ST105-EX01, KAFB-0507, KAFB-0508, and KAFB-0523 to evaluate the effects of long-term pumping, and to calculate aquifer parameters. Manual and electronic measurement frequencies complied with the Work Plan.

2.1.4 Recovery Test

Immediately following the constant rate test (starting at 14:00 on 19 January 2009), water levels were monitored for a period of approximately 67.5 hours for the pumping well to 73.5 hours for the observation wells. The purpose of this monitoring was to evaluate how water levels recovered after pumping from KAFB-ST105-EX01 was stopped. Manual and electronic measurement frequencies complied with the Work Plan.

2.2 Data Analysis

2.2.1 Water-Level Data Corrections

Prior to analysis of aquifer tests, water-level data collected during the constant rate and recovery tests were corrected for the observed long-term water-level trends and changes associated with barometric pressure fluctuations. To calculate the barometric effects, water level and barometric pressure data from the background test were fit with a linear regression. For example, the water level in KAFB-0508 changed by 0.0517 feet per millimeter of mercury (ft/mm Hg) change in barometric pressure. Using this relationship, the effects of barometric pressure changes were removed from the data for KAFB-0508 for the constant rate and recovery tests by multiplying the change (-0.0517 feet/mm Hg) by the barometric pressure (normalized to the barometric pressure at the start of the test) and then subtracting this value from each corresponding water level data point. To calculate long-term trends, the background test data were corrected for barometric pressure then fit with a linear regression (water level vs. time). The slope from the linear regression for KAFB-0508 was 0.039 feet/day indicating an increasing water level trend during the background test. Using this relationship, the long-term trend was removed from the KAFB-0508 water-level data for the constant rate and recovery tests were corrected by subtracting 0.039 feet/day from the water levels. For this analysis, this rate of water level increase was assumed to occur throughout the constant rate and recovery tests. Following removal of barometric pressure effects and long-term trends, the resulting water levels had a small-scale periodic variation of less than 0.05 feet with a period of approximately 12 hours. This variation occurred throughout the background, constant rate and recovery test and is likely a result of earth tides.

Several studies have shown how water levels in aquifers vary due to earth tides, which are caused by the gravitational pull of the moon (Marechal et al., 2002; Hsieh et al., 1988; Bredehoeft, 1967). Measurable water-level fluctuations in wells are caused by the dilation of the earth due mainly to the position of the moon and the sun (Marechal et al., 2002). Due to the relative small magnitude of variation caused by earth tides (less than 0.05 feet), these were not removed from the data. If the earth tides had obscured the drawdown results, they would have also been removed.

2.2.2 Aquifer Test Analysis

To estimate transmissivity, hydraulic conductivity, and storativity of the hydrostratigraphic unit intersected by KAFB-ST105-EX01, the water-level displacements (drawdown) versus time data during the constant rate discharge and recovery tests were analyzed using the standard well hydraulic analysis methods with the aquifer test analysis program AQTESOLV® (Duffield, 2003). Water level data from the constant rate and recovery tests that had been corrected for barometric pressure effects and long-term trends were used in the analysis. The aquifer was assumed to be unconfined and assumed to have a saturated thickness of 67 ft. This was calculated using the pre-pumping static depth to water value of 498 ft. extending to the top of the confining layer of silt at a depth of 565 ft. Observations wells KAFB-0507 and KAFB-0523 did not appear to show a response to pumping (i.e., no drawdown observed), thus aquifer characteristics could not be calculated with water level data from these two wells.

2.3 Investigation Derived Waste

Investigation Derived Waste was handled in accordance with the Waste Management Plan (Appendix E of the BWP; USAF, 2004). The types of IDW generated during the pilot study include personal protective equipment (PPE), miscellaneous disposable equipment, and water pumped from KAFB-ST105-EX01. All field activities were conducted in Level D PPE; therefore, the only PPE that were discarded was disposable work gloves. The PPE and miscellaneous disposable equipment (e.g., paper towels, gloves, etc.) were discarded as non-hazardous municipal waste in the KAFB landfill. The KAFB permit for waste disposal is included in Attachment B.

All water from the aquifer testing program was discharged to a surface water drainage feature near the wellhead under the existing KAFB National Pollution Discharge Elimination System (NPDES) permit. The KAFB NPDES permit requires that nitrate+nitrite concentrations in the discharge water be less than the *New Mexico Water Quality Standards for Interstate and Intrastate Surface Waters; Irrigation, Livestock Watering, and Wildlife Habitat Uses*, 20.6.4.900J NMAC standard of 132 mg/L. The highest nitrate concentration measured in groundwater from KAFB-ST105-EX01 was 33 mg/L (March 2007), which is below this standard. Approximately 250,000 gallons of water were discharged during the aquifer testing. An energy dissipation device approved by KAFB prior to groundwater discharge was used to prevent erosion of the ground surface during discharge of the water.

3.0 AQUIFER TEST RESULTS

3.1 Background Test

Water levels increased steadily during the background test in all wells. These increases in water levels ranged from 0.018 to 0.038 feet/day during the background test for the four wells monitored. The cause of this water-level increase is unknown, but likely a result of regional recharge. In addition to long-term trends in water levels, water levels also showed response to barometric pressure changes and earth tides. In all cases, water-level changes associated with barometric pressure changes had a maximum variation of approximately 0.13 feet during the test period. Following removal of barometric pressure effects and long-term trends, the resulting water levels had a small-scale periodic variation of less than 0.05 feet with a period of approximately 12 hours, likely were the result of earth tides.

3.2 Step Test

The results of the step test are listed in Table 3-1. Specific capacity values were calculated with the pumping rate and drawdown data collected at the end of each step. Water level data from the step test are provided in Figure 3-1. The water level recovery observed between the 53 gpm and 55 gpm step was a result of discontinuation of pumping for 20 minutes while the one-inch diameter discharge pipe was replaced with two-inch diameter discharge pipe in to achieve a higher pumping rate.

A pumping rate of 15 gpm was attempted for the first step, but a steady pumping rate could not be maintained. As a result, this step was discontinued and the water level in KAFB-ST105-EX01 was allowed to recovery prior to starting the 25 gpm step. Although the aquifer would support a pumping rate greater than 55 gpm, the pump used for the test (25 hp) was operating at maximum capacity due to well depth and lift, thus the rate could not be increased above 55 gpm. The one-inch diameter discharge pipe was replaced with two-inch diameter discharge pipe towards the end of the step test to try and achieve a higher pumping rate, but was minimally successful. Because this pumping rate was not significantly greater than that of the previous step, the step was not run for the full two hours. To allow for minor adjustments (increases) in pumping rate during the constant rate test, the pumping rate was set at 53 gpm.

Table 3-1 KAFB ST-105 EX001 Step Test Results (15 January 2009)

Step	Pumping Rate (gpm)	Drawdown (ft)	Specific Capacity (gpm/ft)	Duration (hours)
1	25	2.2	11.4	2
2	40	4.5	8.9	2
3	53	6.8	7.8	2
4	55	6.8	8.1	0.5
ft feet gpm gallons per minute				

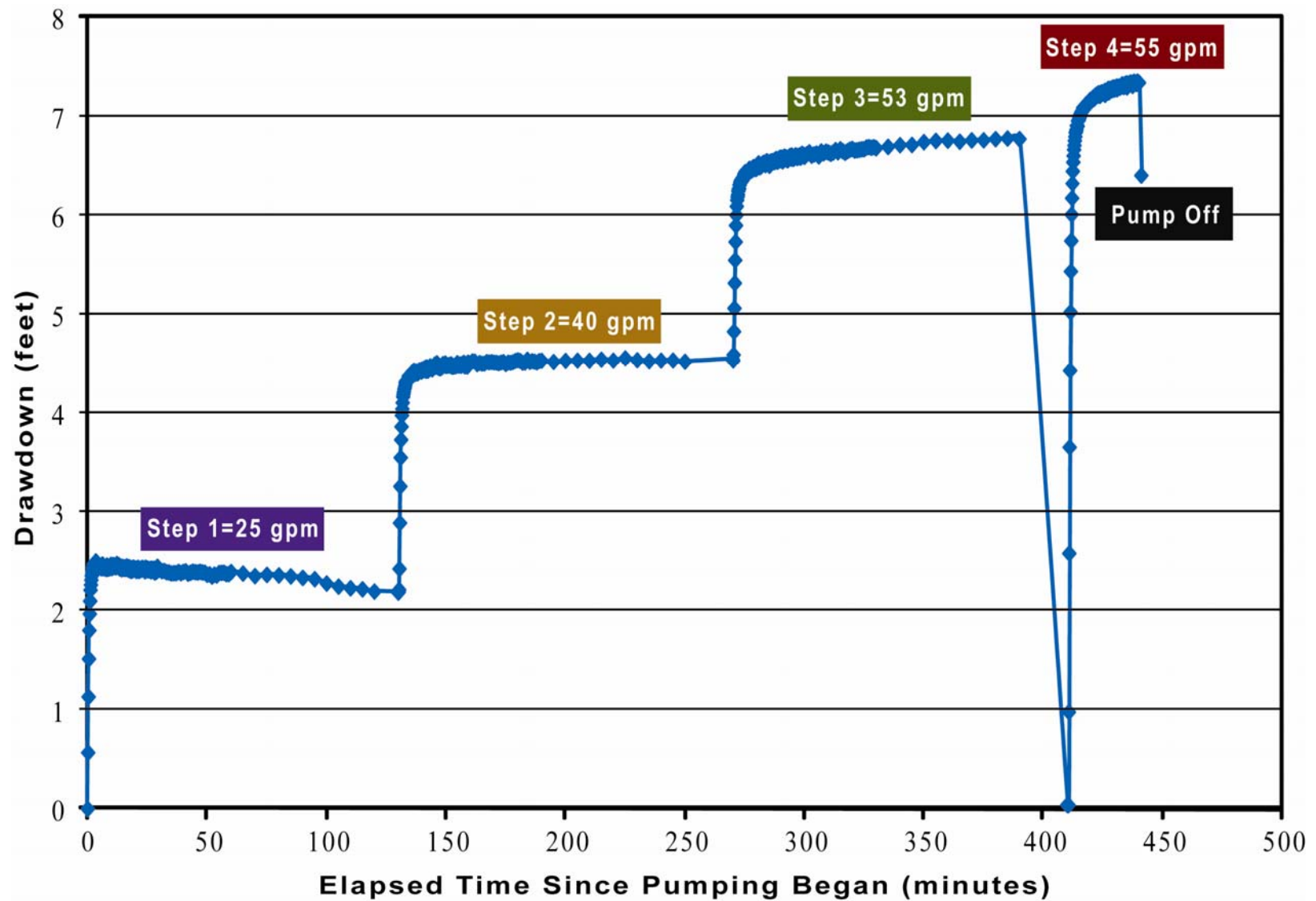


Figure 3-1. KAFB ST-105 EX001 Step Drawdown Test (15 January 2009)

3.3 Constant Rate Test

During the constant rate test, KAFB-ST105-EX01 was pumped at approximately 53 gpm for 72 hours. The water level in KAFB-ST105-EX01 declined by 6.9 feet during the test (see Figure 3-2), resulting in a specific capacity of 7.7 gpm/ft of drawdown, which corresponds closely with the specific capacities calculated for the last two steps of the step test. Pumping of well KAFB-ST105-EX01 impacted water levels by up to 0.3 ft. in KAFB-0508 (see Figure 3-3), which is located approximately 70 feet from KAFB-ST105-EX01, indicating that this well is hydraulically connected to KAFB-ST105-EX01. The elevation of the screened interval of monitoring well KAFB-0508 corresponds with the top portion of the screen in KAFB-ST105-EX01. Minor diurnal variations evident in the data are attributable to earth tides, but are insignificant relative to the drawdown caused by pumping at KAFB-ST105-EX01. The water levels in the other observation wells (KAFB-0507 and KAFB-0523) showed no changes related to pumping at KAFB-ST105-EX01, either prior to or following correction of water levels for long-term trends and barometric pressure changes (see Figure 3-4 and 3-5). KAFB-0507 and KAFB-0523 are 1,197 and 927 ft. from KAFB-ST105-EX01, respectively.

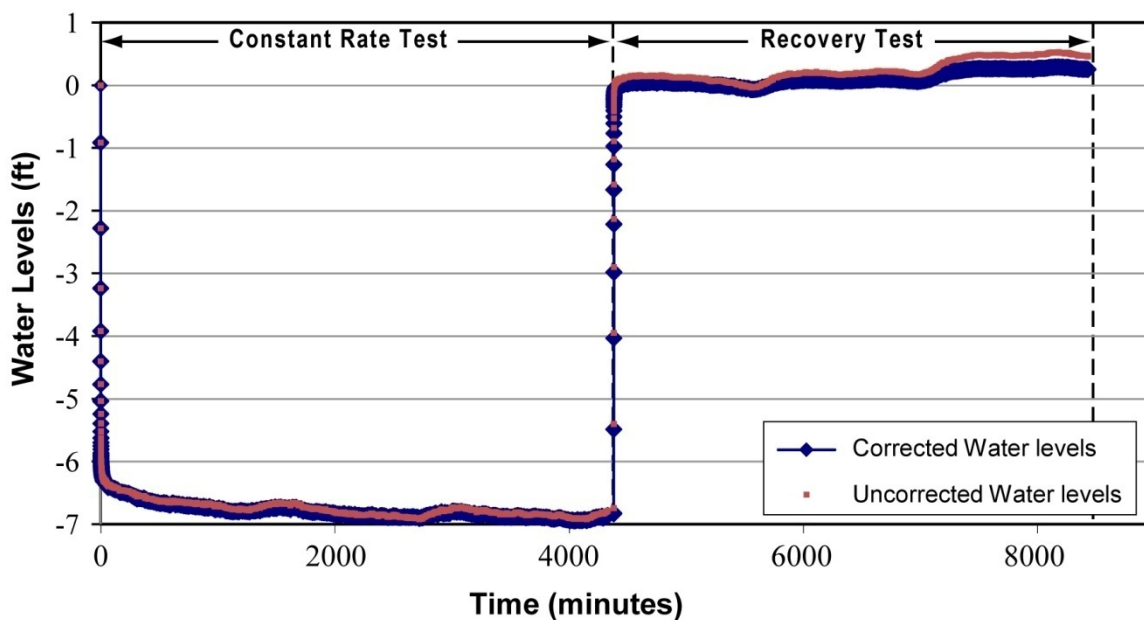


Figure 3-2. Water Levels in KAFB-ST105-EX01 During the Constant Rate and Recovery Tests

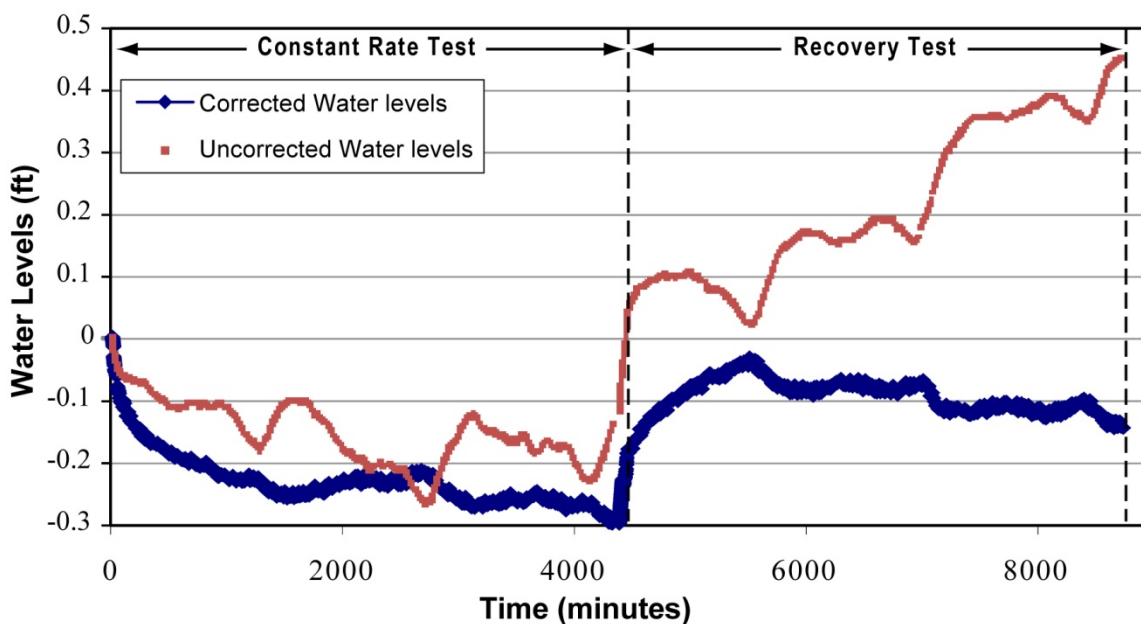


Figure 3-3. Water Levels in KAFB-0508 During the Constant Rate and Recovery Tests

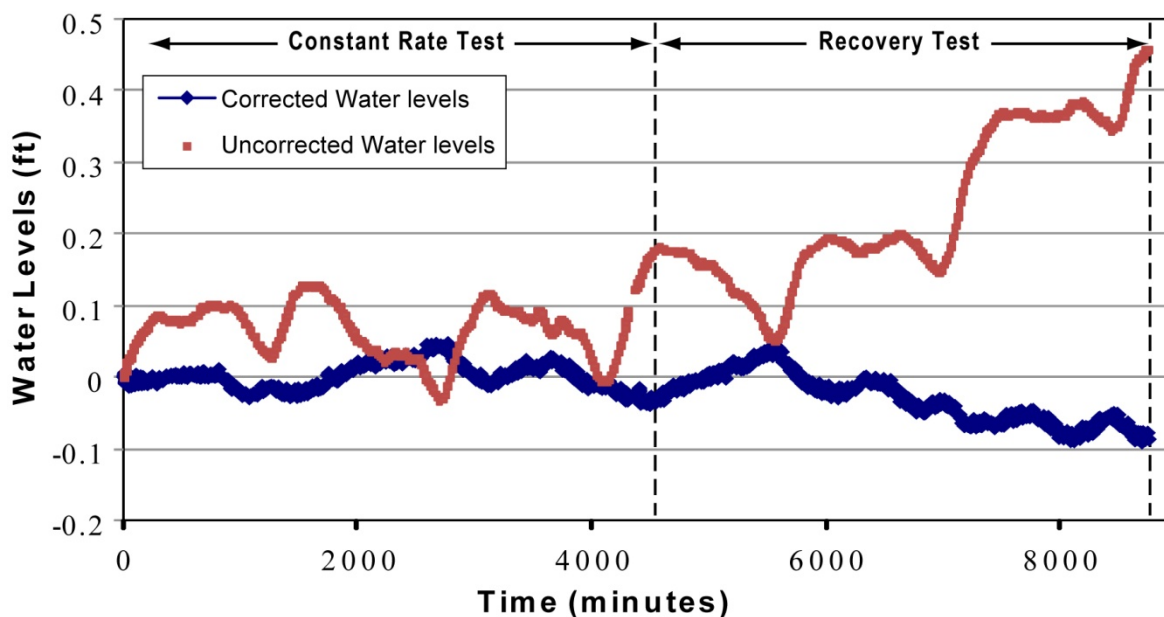


Figure 3-4. Water Levels in KAFB-0507 During the Constant Rate and Recovery Tests

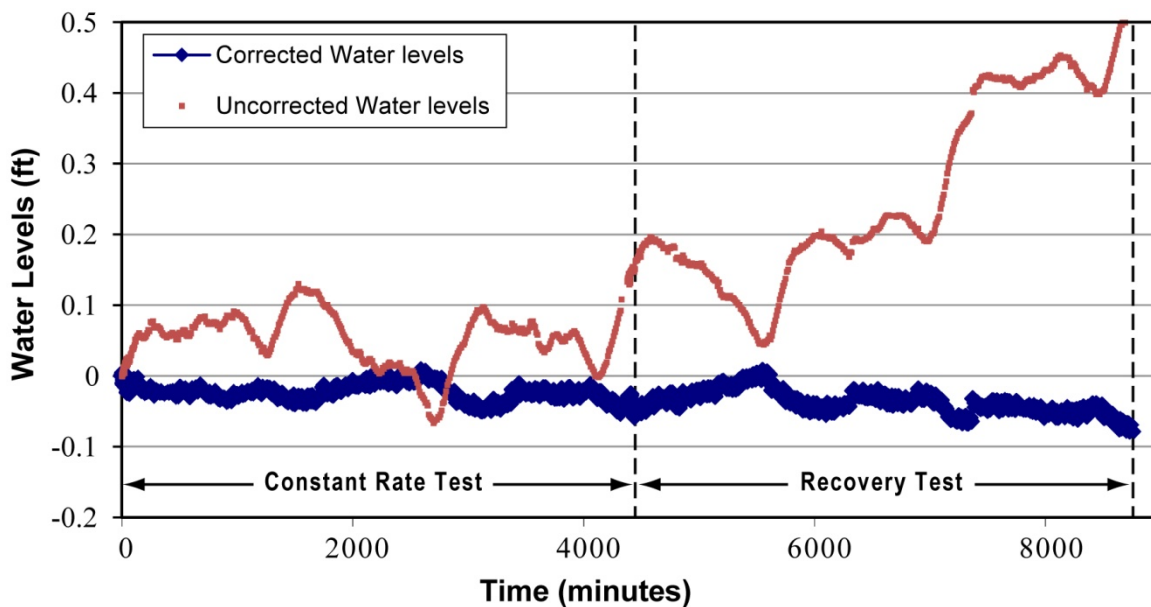


Figure 3-5. Water Levels in KAFB-0523 During the Constant Rate and Recovery Tests

3.4 Recovery Test

The water-level in the KAFB-ST105-EX01 recovered by 6.7 feet within eight minutes (approximately 97 percent of drawdown). Recovery data in KAFB-ST105-EX01 continued to be collected until 09:30 on 22 January 2009 (67.5 hours). Water levels in KAFB-0508 began to recover approximately three minutes after pumping of KAFB-ST105-EX01 was stopped and had recovered by almost 75 percent after one hour. Recovery data in KAFB-0508 continued to be collected until 15:30 on 22 January 2009 (73.5 hours). Water levels were monitored in KAFB-0507 and KAFB-0523 during the recovery test, but no response attributable to the aquifer test was visible.

3.5 Aquifer Characteristics

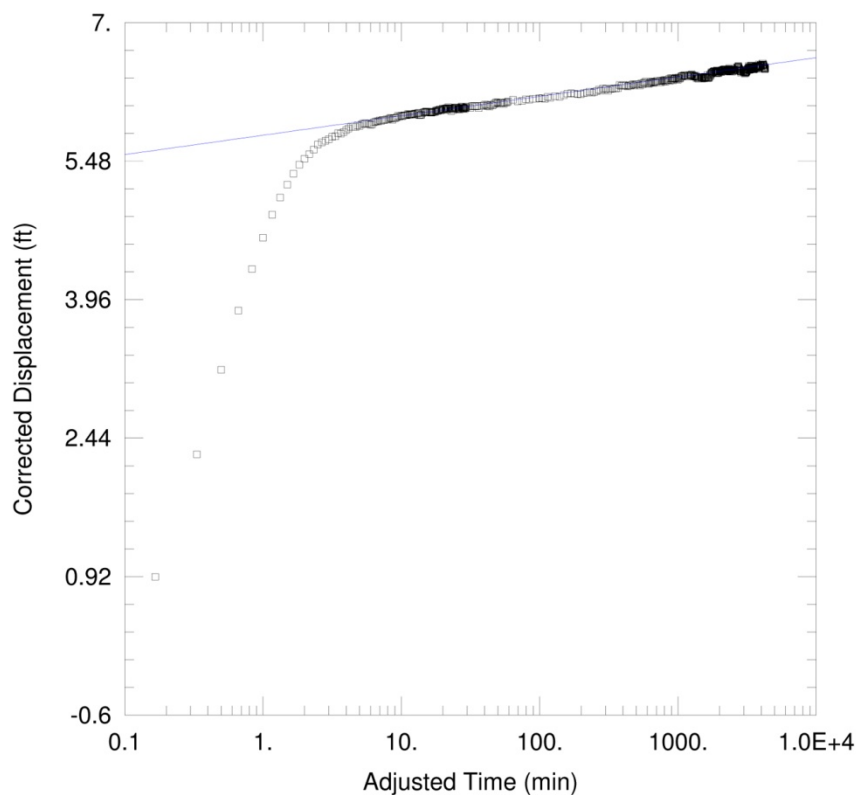
The corrected water-level data for KAFB-ST105-EX01 and KAFB-0508 were analyzed to estimate aquifer hydraulic property values. The results of these analyses are listed in Table 3-2.

Using water level data from extraction well KAFB-ST105-EX 01, a transmissivity of 8,800 ft²/day and hydraulic conductivity of 131 ft/day were calculated using the Cooper Jacob straight line method (see Figure 3-6). The Theis method was attempted, but a good fit of the data could not be achieved. Storativity cannot be calculated in the pumping well due to energy losses as the water rushes into the well (Fetter, 1988).

For observation well KAFB-0508 the transmissivity of approximately 16,500 ft²/day was calculated using the Theis method using both drawdown and recovery data (see Figure 3-7). Assuming an aquifer thickness of 67 ft, the hydraulic conductivity calculated is 246 ft/day. The storativity calculated using the Theis method using both drawdown and recovery data, is 0.05 (dimensionless). The higher values of transmissivity and hydraulic conductivity calculated with water level data from KAFB-0508 relative to those calculated with data from KAFB-ST105-EX01 are likely due to well losses and well inefficiencies in the pumping well. Therefore, the aquifer parameter values calculated with data from KAFB-0508 are more representative of the aquifer.

Table 3-2 Aquifer Test Results

Well ID	Hydraulic Conductivity (ft/day)	Transmissivity (ft ² /day)	Storativity (dimensionless)	Saturated Thickness (ft)	Distance from pumping well (ft)	Method Used
KAFB-ST105-EX01	131	8,800	NA	67	0	Cooper Jacob
KAFB-507	NA	NA	NA	67	1197	NA
KAFB-508	246	16,500	0.05	67	70	Theis
KAFB-523	NA	NA	NA	67	927	NA



KAFB-EX001 AQUIFER TEST ON PUMPING WELL

Data Set: \\...\\EX001 drawdown-recoveryCooperJacob.aqt

Date: 02/06/09

Time: 12:53:34

PROJECT INFORMATION

Company: MWH Global

Client: KAFB

Project: 1971105.06010302

Location: Albuequerque, New Mexico

Test Well: KAFB-EX001

Test Date: January 16-22

AQUIFER DATA

Saturated Thickness: 67. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KAFB-EX001	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ KAFB-EX001	0.416666	0

SOLUTION

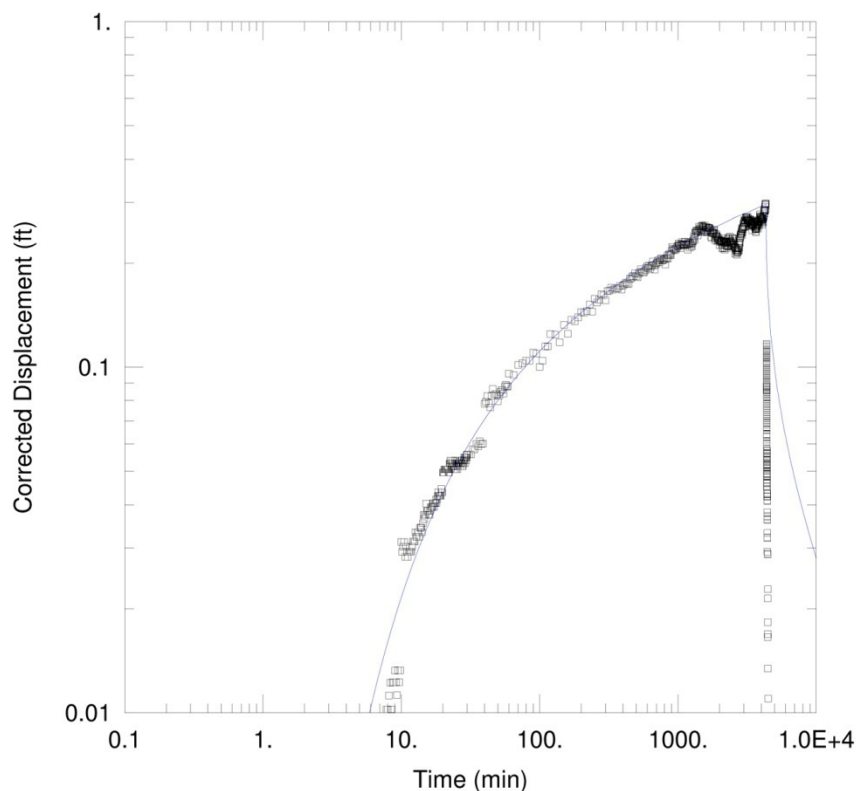
Aquifer Model: Unconfined

Solution Method: Cooper-Jacob

T = 8776.9 ft²/day

S = 6.728E-26

Figure 3-6. Cooper Jacob Method of Analysis of KAFB-ST105-EX01 Drawdown Data



KAFB-0508 DRAWDOWN/RECOVERY AQUIFER TEST

Data Set: \...\0508-Drawdown-recoveryThies.aqt

Date: 02/06/09

Time: 12:52:08

PROJECT INFORMATION

Company: MWH Global
 Client: Kirtland AFB
 Project: 1971105.06010302
 Location: Albuquerque, New Mexico
 Test Well: KAFB-EX001
 Test Date: January 16-22, 2009

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
KAFB-EX011	0	0	□ KAFB-0508	70	0

SOLUTION

Aquifer Model: Unconfined

Solution Method: Theis

$T = 1.645E+4 \text{ ft}^2/\text{day}$

$S = 0.05728$

$Kz/Kr = 0.0007347$

$b = 67. \text{ ft}$

Figure 3-7. Theis Method of Analysis of KAFB-0508 Drawdown and Recovery Data

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Prior to redevelopment, extraction well KAFB-ST105-EX01 did not perform as expected due to low sustainable pumping rates. Data collected during well re-development in August 2008 suggested that the redevelopment had improved well performance, which was confirmed by the aquifer test performed in January 2009. The aquifer test yielded aquifer parameter values that are more consistent with the original expectations for the aquifer and the values used in the groundwater model of the area constructed by the USGS (McAda and Barroll, 2002; Ruskauff, 2003). Additionally, the results of the aquifer test indicate that a pumping rate greater than 55 gpm is sustainable for extraction well KAFB-ST105-EX01.

These data are of sufficient quality to meet the objectives of this project, which were to:

- Evaluate if pumping at KAFB-ST105-EX01 could create a capture zone (i.e., a hydraulic depression) that would reduce downgradient contaminant migration (i.e., provide containment of nitrate contaminated groundwater).
- Assess the connectivity (or lack thereof) of groundwater flow paths intersected by KAFB-ST105-EX01 and the observation wells.
- Estimate hydraulic properties and characteristics (e.g., hydraulic conductivity, transmissivity, storativity) of the nitrate contaminated zone of the regional aquifer.
- Evaluate if pumping KAFB-ST105-EX01 could remove significant contaminant (nitrate) mass.
- Evaluate if pumping would mitigate nitrate migration to KAFB-16 (a downgradient production well).

Based on a preliminary assessment the aquifer test results indicate that use of extraction well KAFB-ST105-EX01 to remove Plume 1 nitrate contaminated groundwater will meet the objectives of the Stage 2 Abatement Plan for nitrate capture and nitrate mass reduction in groundwater. The aquifer test data will be used in the MODFLOW and MT3DMS groundwater flow and contaminant transport modeling (performed under separate contract) that will further assess nitrate capture and mass reduction.

4.2 Recommendations

Based on the aquifer test data from April 2007 and the initial well development results from April 2007 it was thought that the maximum size pump that could be used for the aquifer testing was 25 hp; if a larger pump was used for the test the groundwater discharge would be insufficient to cool the pump resulting in pump damage. However, the results of the aquifer testing are favorable, and indicate that a pumping rate greater than 55 gpm can be sustained. In addition, preliminary results (unpublished) of the groundwater modeling indicate that a pumping rate of approximately 140 gpm may be sustainable. However, these data are extrapolated from the results of the aquifer test and actual pumping data are needed to further assess sustainable pumping rates. It is recommended that additional aquifer testing be performed to determine the maximum sustainable pumping rate for this well to refine the groundwater model and further refine the capture zone analysis. In addition, if this well is brought on line to support groundwater

extraction as part of the ST-105 nitrate abatement plan; these data will be required for determining the size of permanent pump to be installed in the extraction well.

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ATTACHMENT A

AQUIFER TEST FIELD FORMS AND FIELD NOTES

AQUIFER TEST DATA SHEET

(OBSERVATION WELLS)

Page 1 of 2*Pumping*

PROJECT NAME: KAFB PROJECT NO: 1971112 PIEZO NO: EX-001
 DATE: _____ PUMP DEPTH: _____ TEST NO: Step 25gpm
 TYPE OF TEST: _____ PUMPED WELL NO: _____ DISTANCE FROM PUMPING WELL: _____
 MEASURING EQUIPMENT: _____ HYDROGEOLOGIST: _____

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On Date/Time: _____ Pump Off Date/Time: _____ Duration of Aquifer Test: _____ Pumping: _____ Recovery: _____		Pretest Water Level: _____ Static Water Level: <u>497.70</u> Measuring Point: _____ Elevation of Measuring Point: _____ <u>25gpm</u>							
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
1-15-09	1220	497.70		0					
	1	499.83		25.36					
	2	500.16		25.46					
	3	500.20		25.41					
	4	500.19		24.80					
	5	500.17		24.55					
	6	500.16		24.50					
	7	500.16		24.40					
	8	500.16		24.40					
	9	500.16		24.40					
	10	500.16		24.35					
	11	500.16		24.35					
	12	500.16		24.40					
	13	500.16		24.30					
	14	500.16		24.25					
	15	500.12		24.18					
	16	500.08		24.10					
	17	500.08		24.00					
	18	500.06		23.95					
	19	500.08		24.00					
	20	500.14		23.95					
	21	500.14		23.95					
	22	500.14		23.95					
	23	500.14		23.95					
	24	500.14		24.00					
	25	500.14		23.95					
	26	500.14		23.95					
	27	500.14		23.95					

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

Pumping

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

1 cubic foot = 7.48 gallons

AQUIFER TEST DATA SHEET (OBSERVATION WELLS)

Page 1 of 2

Pumping

PROJECT NAME: KAFB PROJECT NO: 1971112.06010401 PIEZO NO: KAFB-EX-001
 DATE: 1-19-09 PUMP DEPTH: 574' TEST NO: 5th
 TYPE OF TEST: AP PUMPED WELL NO: KAFB-EX-001 DISTANCE FROM PUMPING WELL: 0
 MEASURING EQUIPMENT: Insitu WBE Transducer HYDROGEOLOGIST: _____

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On Date/Time	<u>1-15-09</u>	Pretest Water Level	<u>497.76</u>						
Pump Off Date/Time	<u>1-15-09</u>	Static Water Level							
Duration of Aquifer Test		Measuring Point	<u>100N</u>						
Pumping		Elevation of Measuring Point							
Recovery		<u>409 gpm</u>							
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
	<u>1</u>	<u>501.46</u>		<u>40.08</u>					
	<u>2</u>	<u>501.92</u>		<u>40.03</u>					
	<u>3</u>	<u>502.02</u>		<u>39.98</u>					
	<u>4</u>	<u>502.08</u>		<u>39.98</u>					
	<u>5</u>	<u>502.10</u>		<u>39.88</u>					
	<u>6</u>	<u>502.12</u>		<u>39.93</u>					
	<u>7</u>	<u>502.14</u>		<u>39.93</u>					
	<u>8</u>	<u>502.15</u>		<u>39.93</u>					
	<u>9</u>	<u>502.15</u>		<u>39.93</u>					
	<u>10</u>	<u>502.16</u>		<u>39.93</u>					
	<u>11</u>	<u>502.18</u>		<u>39.93</u>					
	<u>12</u>	<u>502.18</u>		<u>39.93</u>					
	<u>13</u>	<u>502.19</u>		<u>39.98</u>					
	<u>14</u>	<u>502.20</u>		<u>40.03</u>					
	<u>15</u>	<u>502.20</u>		<u>39.98</u>					
	<u>16</u>	<u>502.20</u>		<u>39.98</u>					
	<u>17</u>	<u>502.20</u>		<u>39.98</u>					
	<u>18</u>	<u>502.21</u>		<u>39.93</u>					
	<u>19</u>	<u>502.21</u>		<u>39.98</u>					
	<u>20</u>	<u>502.21</u>		<u>39.93</u>					
	<u>21</u>	<u>502.22</u>		<u>39.88</u>					
	<u>22</u>	<u>502.22</u>		<u>39.88</u>					
	<u>23</u>	<u>502.22</u>		<u>39.88</u>					
	<u>24</u>	<u>502.22</u>		<u>39.83</u>					
	<u>25</u>	<u>502.22</u>		<u>39.83</u>					
	<u>26</u>	<u>502.22</u>		<u>39.88</u>					
	<u>27</u>	<u>502.22</u>		<u>39.88</u>					

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

Rumoring

PROJECT NAME: _____ PROJECT NO: 1971112.06010901 PIEZO NO: KAFB-EX-001
DATE: 1-15-09 PUMP DEPTH: 574.00' TEST NO: Step 40 gpm
TYPE OF TEST: AQ PUMPED WELL NO: _____ DISTANCE FROM PUMPING WELL: 0
MEASURING EQUIPMENT: _____ HYDROGEOLOGIST: DWA

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On Date/Time _____	Pretest Water Level _____								
Pump Off Date/Time _____	Static Water Level _____								
Duration of Aquifer Test _____	Measuring Point _____								
Pumping _____	Elevation of Measuring Point _____								
Recovery _____									
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
1-15-09	28	502.32		39.88					
	29	502.23		39.88					
	30	502.33		39.88					
	35	502.24		39.83					
	40	Mixed							
	45	Mixed							
	50	502.20		39.78					
	55	502.19		39.78					
	60	502.18		39.78					
	70	502.19		39.73					
	80	502.25		39.68					
	90	502.27		39.73					
	100	502.27		39.63					
	110	502.27		39.63					
	120	502.23		39.63					
		TOTALIZED Readings			A - 8538		gallons		
					B - 483890		"		

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

A = digital B = Analog

AQUIFER TEST DATA SHEET

(OBSERVATION WELLS)

Page 1 of 2

Remapping

PROJECT NAME: KMF3 PROJECT NO: 1971112-06010401 PIEZO NO: K19FB-EX-001
 DATE: 1-15-09 PUMP DEPTH: 574' TEST NO: STP-60 gpm
 TYPE OF TEST: AQ PUMPED WELL NO: _____ DISTANCE FROM PUMPING WELL: 0
 MEASURING EQUIPMENT: WLT - Transducer HYDROGEOLOGIST: _____

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On: Date/Time		Pretest Water Level							
Pump Off: Date/Time		Static Water Level							
Duration of Aquifer Test		Measuring Point							
Pumping		Elevation of Measuring Point							
Recovery		53.95 wide open through 1" Pipe							
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
	1	504.00		53.85					
	2	Missed							
	3	504.06		53.90					
	4	504.11		53.90					
	5	504.15		53.90					
	6	504.16		53.85					
	7	504.19		53.90					
	8	504.20		53.90					
	9	504.22		53.90					
	10	504.23		53.90					
	11	504.23		53.90					
	12	504.26		53.95					
	13	504.27		53.95					
	14	Missed							
	15	Missed							
	16	504.28		53.95					
	17	504.28		53.95					
	18	504.28		53.95					
	19	504.29		53.95					
	20	504.30		54.00					
	21	504.29		53.95					
	22	504.29		53.95					
	23	504.30		53.95					
	24	504.31		53.95					
	25	504.32		53.95					
	26	504.32		53.95					
	27	504.32		53.95					

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

Pumping

Page 7 of 2

PROJECT NAME: _____ PROJECT NO: _____ PIEZO NO: KRFB-EX-001
DATE: _____ PUMP DEPTH: _____ TEST NO: STEP-60gpm
TYPE OF TEST: _____ PUMPED WELL NO: _____ DISTANCE FROM PUMPING WELL: _____
MEASURING EQUIPMENT: _____ HYDROGEOLOGIST: _____

[illegible]

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

Page 1 of 1

Page 7 of 7

WELL NO: KAF13-EX-001
TEST NO: STY for 70 gpm
DISTANCE FROM PUMPING WELL: 0
HYDROGEOLOGIST:

[illegible]

1 cubic foot = 7.48 gallons

**AQUIFER TEST DATA SHEET
(PUMPING WELL)**

Page 1 of 3

PROJECT NAME: KAFB PROJECT NO: 1971112.06010401 WELL NO: KAFB-ST105-EX-001
 DATE: 1-16-09 PUMP DEPTH: 574.00' TEST NO: CONSTANT @ 53 gpm
 TYPE OF TEST: AD PUMPED WELL NO: EX-001 DISTANCE FROM PUMPING WELL: 0
 MEASURING EQUIPMENT: WLT, Transducer HYDROGEOLOGIST: _____

Time Data			Water Level Data			Water Quality			
Pump On: Date/Time <u>1-16</u> (t)			Pretest Water Level <u>497.76</u>						
Pump Off: Date/Time _____ (t')			Static Water Level: <u>497.77</u>						
Duration of Aquifer Test: <u>72 hrs</u>			Measuring Point: <u>YOLN</u>						
Pumping: _____			Elevation of Measuring Point: _____						
Recovery: _____									
	Time Since Pump Started	Time Since Pump Stopped	Depth to Water	Pressure Transducer	Flow Rate	pH	Specific Conductivity	Temperature	Comments on factors affecting test data
Date	t (min)	t' (min)	(ft)	(XD)	(gpm)				
<u>1-16-09</u>	<u>1</u>		<u>502.60</u>		<u>52.84</u>				
	<u>2</u>		<u>503.50</u>		<u>52.74</u>				
	<u>3</u>		<u>503.70</u>		<u>52.74</u>				
	<u>4</u>		<u>503.81</u>		<u>52.68</u>				
	<u>5</u>		<u>503.85</u>		<u>52.68</u>				
	<u>6</u>		<u>503.86</u>		<u>52.63</u>				
	<u>7</u>		<u>503.86</u>		<u>52.79</u>				
	<u>8</u>		<u>503.95</u>		<u>52.69</u>				
	<u>9</u>		<u>503.97</u>		<u>52.68</u>				
	<u>10</u>		<u>503.98</u>		<u>52.63</u>				
	<u>11</u>		<u>503.99</u>		<u>52.74</u>				
	<u>12</u>		<u>504.00</u>		<u>52.68</u>				
	<u>13</u>		<u>504.01</u>		<u>52.58</u>				
	<u>14</u>		<u>504.02</u>		<u>52.58</u>				
	<u>15</u>		<u>504.03</u>		<u>52.63</u>				
	<u>16</u>		<u>504.03</u>		<u>52.58</u>				
	<u>17</u>		<u>504.04</u>		<u>52.58</u>				
	<u>18</u>		<u>504.04</u>		<u>52.53</u>				
	<u>19</u>		<u>504.06</u>		<u>52.53</u>				
	<u>20</u>		<u>504.04</u>		<u>52.58</u>				
	<u>21</u>		<u>504.06</u>		<u>52.48</u>				
	<u>22</u>		<u>504.06</u>		<u>52.48</u>				
	<u>23</u>		<u>504.06</u>		<u>52.48</u>				
	<u>24</u>		<u>504.07</u>		<u>52.48</u>				
	<u>25</u>		<u>504.07</u>		<u>52.48</u>				
	<u>26</u>		<u>504.07</u>		<u>52.48</u>				
	<u>27</u>		<u>504.08</u>		<u>52.48</u>				

Conversion Factors: 1 PSI = 2.31 feet

1 cubic foot = 7.48 gallons

AQUIFER TEST DATA SHEET (PUMPING WELL)

Page 2 of 3

PROJECT NAME: KHFB
 DATE: 1-16-09
 TYPE OF TEST: AQ
 MEASURING EQUIPMENT: _____

PROJECT NO: 1971112
 PUMP DEPTH: 574'
 PUMPED WELL NO: EX001

WELL NO: KHFB-ST105-EX-001
 TEST NO: CONSTANT RATE
 DISTANCE FROM PUMPING WELL: 0
 HYDROGEOLOGIST: Zak Brown

Time Data			Water Level Data			Water Quality			
Pump On: Date/Time _____ (t)			Pretest Water Level: _____						
Pump Off: Date/Time _____ (t')			Static Water Level: _____						
Duration of Aquifer Test: _____			Measuring Point: _____						
Pumping: _____			Elevation of Measuring Point: _____						
Recovery: _____			52.48 gpm						
Date	Time Since Pump Started t (min)	Time Since Pump Stopped t' (min)	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	pH	Specific Conductivity	Temperature	Comments on factors affecting test data
1-16-09	28		504.08		52.48				
	29		504.08		52.48				
	30		504.08		52.48				
	35		504.10		52.53				
	40		504.11		52.53				
	45		504.12		52.48				
	50		504.13		52.53				
	55		504.15		52.58				
	60		504.09		52.58				
	70		504.14		52.48				
	80		504.15		52.48				
	90		504.11		52.53				
	100		504.11		52.58				
	110		504.12		52.53				
	120		504.13		52.53				
	150		504.15		52.58				
	180		504.21		52.68				
	210		504.26		52.63				
	240		504.28		52.68				
	270		504.30		52.74				dig. val @ 1800
	300		504.29		52.94				32193
	330		504.30		52.89				507685 @ 1800
	360		504.29		52.79				Ann log
390	400		504.31		52.89				
	420		504.32		52.99				
	450		504.32		52.99				
	480		504.32		53.09				

Conversion Factors: 1 PSI = 2.31 feet

1 cubic foot = 7.48 gallons

400
420
700
730
8
820
9pm

digital @ 1800
32193
507685 @ 1800
Analogue

AQUIFER TEST DATA SHEET (PUMPING WELL)

Page 3 of 3

PROJECT NAME: KAFFB
 DATE: 1-16-09
 TYPE OF TEST: AR
 MEASURING EQUIPMENT: WLI, Transducer

PROJECT NO: 197112
 PUMP DEPTH: 574'
 PUMPED WELL NO: EX001

WELL NO: KAFFB-ST105-EX001
 TEST NO: Constant Rate
 DISTANCE FROM PUMPING WELL: 0
 HYDROGEOLOGIST: DWM

Time Data			Water Level Data			Water Quality			
Pump On: Date/Time _____ (t)			Pretest Water Level: <u>497.76</u>						
Pump Off: Date/Time _____ (t')			Static Water Level: _____						
Duration of Aquifer Test: _____			Measuring Point: _____						
Pumping: _____			Elevation of Measuring Point: _____						
Recovery: _____									
Date	Time Since Pump Started t (min)	Time Since Pump Stopped t' (min)	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	pH	Specific Conductivity	Temperature	Comments on factors affecting test data
1-16-09	540		504.33		53.04				
	600		504.34		52.99				
	660		504.34		53.04				
1-17-09	720		504.36		53.09				
	960		504.40		53.24	67378.0			Digital
	1200		504.49		53.19				Analog
	1440		504.48		52.99				
	1680		504.48		52.94	80581			Digital Totalizer
	1920		504.57		53.19	552387			Analog Totalizer
1-18-09	2160		504.62		53.24				
	2400		504.64	143784	53.40	104907			Digital @ 1700
	2640		504.61		53.19	574810			Analog
	2880		504.54		52.99				
	3120		504.47		52.89	180809			Digital 1700 1/18
	3360		504.52		53.19	645225			Analog
1-19-09	3600		504.55		53.09				
	3840		504.59		53.34	219758			
	4080		504.64		53.24				
	4320		504.51		52.99				
Digital Totalizer @ Finish was - 247,763									
Analog Totalizer @ Finish was - 707,464									

Conversion Factors: 1 PSI = 2.31 feet

1 cubic foot = 7.48 gallons

AQUIFER TEST DATA SHEET (PUMPING WELL)

Page 1 of 3

PROJECT NAME: KAFB
 DATE: 1-19-09
 TYPE OF TEST: _____
 MEASURING EQUIPMENT: _____

PROJECT NO: 197112
 PUMP DEPTH: 574'
 PUMPED WELL NO: EX001

WELL NO: KAFB-ST105-EX001
 TEST NO: RECOVERY
 DISTANCE FROM PUMPING WELL: 0
 HYDROGEOLOGIST: _____

Time Data			Water Level Data			Water Quality			Comments on factors affecting test data
Pump On: Date/Time _____ (t) Pump Off: Date/Time _____ (t) Duration of Aquifer Test: _____ Pumping: _____ Recovery: _____			Pretest Water Level: _____ Static Water Level: _____ Measuring Point: _____ Elevation of Measuring Point: _____						
Date	Time Since Pump Started t (min)	Time Since Pump Stopped t' (min)	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	pH	Specific Conductivity	Temperature	
2pm	1-19-09	28	0	504.49		52.84			
		2	1	502.26		0			
			2	499.28					
			3	498.02					
			4	497.83					
			5	497.80					
			6	497.75					
			7	497.74					
			8	497.73					
			9	497.71					
			10	497.71					
			11	497.71					
			12	497.70					
			13	497.69					
			14	497.69					
			15	497.73					
			16	497.73					
			17	497.73					
			18	497.66					
			19	497.66					
			20	497.66					
			21	—					
			22	497.72					
			23	497.72					
			24	497.72					
			25	497.72					
		26	497.72						

Conversion Factors: 1 PSI = 2.31 feet

1 cubic foot = 7.48 gallons

AQUIFER TEST DATA SHEET (PUMPING WELL)

Page 2 of 3

PROJECT NAME: KAFB PROJECT NO: 197112
 DATE: 1-19-09 PUMP DEPTH: 574'
 TYPE OF TEST: AQ PUMPED WELL NO: EX001
 MEASURING EQUIPMENT: WLT, Transducer

WELL NO: KAFB-5105-EX001
 TEST NO: RECOVER
 DISTANCE FROM PUMPING WELL: 0
 HYDROGEOLOGIST: _____

Time Data			Water Level Data			Water Quality			Comments on factors affecting test data
Pump On: Date/Time _____ (t) Pump Off: Date/Time _____ (t) Duration of Aquifer Test: _____ Pumping: _____ Recovery: _____			Pretest Water Level: _____ Static Water Level: _____ Measuring Point: _____ Elevation of Measuring Point: _____						
Date	Time Since Pump Started t (min)	Time Since Pump Stopped t' (min)	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	pH	Specific Conductivity	Temperature	
1-19-09		27	497.72		0				
		28	497.72						
		29	497.72						
		30	497.72						
		35	497.72						
		40	497.71						
		45	497.71						
		50	497.70						
		55	497.69						
		60	497.69						
		70	497.68						
		80	497.68						
		90	497.68						
		100	497.67						
		110	497.67						
		120	497.67						
		150	497.65						
		180	497.65						
		210	497.65						
		240	497.66						
		270	—						
		300	497.65						
		330	—						
		360	497.65						
	390	420	—						
	420	450	497.64						
	450	480	—						

Conversion Factors: 1 PSI = 2.31 feet

1 cubic foot = 7.48 gallons

3 pm
4 pm
5 pm
6 pm
7 pm
8 pm
9 pm

Page 3 of 3

[illegible]

1 cubic foot = 7.48 gallons

PROJECT NAME: KAFB PROJECT NO: 1971112 PIEZO NO: KAFB-0508
DATE: 6-12-09 PUMP DEPTH: 374' TEST NO: BACKGROUN d
TYPE OF TEST: AQUIFER PUMPED WELL NO: KAFB-FY-001 DISTANCE FROM PUMPING WELL: _____
MEASURING EQUIPMENT: INSITU WEL HYDROGEOLOGIST: _____

[illegible]

PROJECT NAME: K19FD

PROJECT NO:

PIEZO NO:

DATE: _____

PUMP DEPTH:

TEST NO: _

TYPE OF TEST:

PUMPED WELL NO:

DISTANCE FROM PUMPING WELL:

MEASURING EQUIPMENT:

HYDROGEOLOGIST:

[illegible]

PROJECT NAME: KAFB

PROJECT NO: 1991112-06010401

PIEZO NO: 12AFB-0525

DATE: _____

PUMP DEPTH: _____

TEST NO: Background

TYPE OF TEST: _____

PUMPED WELL NO: _____

DISTANCE FROM PUMPING WELL:

MEASURING EQUIPMENT: _____

HYDROGEOLOGIST:

[illegible]

AQUIFER TEST DATA SHEET (OBSERVATION WELLS)

Page 1 of 1

PROJECT NAME: KAFB PROJECT NO: 1971112 PIEZO NO: KAFB-0507
 DATE: 1/16/09 PUMP DEPTH: 574 ft TEST NO: Constant Rate
 TYPE OF TEST: AQ PUMPED WELL NO: KAFB-EX001 DISTANCE FROM PUMPING WELL:
 MEASURING EQUIPMENT: Water Level Indicator, Transducer HYDROGEOLOGIST: Rob Young

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On Date/Time _____		Pretest Water Level <u>502.11</u>							
Pump Off Date/Time _____		Static Water Level _____							
Duration of Aquifer Test _____		Measuring Point: <u>Top of PVC pump head</u>							
Pumping _____		Elevation of Measuring Point _____							
Recovery _____									
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
1/16/09	1132	502.14			1/17/09	0103	502.02		
"	1205	502.10			1/17/09	0502	502.03		
"	1315	502.09			1/17/09	0900	502.08		
"	1326	502.09			1-17-09	1310	502.03		
"	1337	502.08			1-17-09	1711	502.00		
"	1347	502.08			1-17-09	22104	502.04		
"	1358	502.08			1-18-09	0101	502.07		
"	1408	502.08			1-18-09	0504	502.07		
"	1418	502.08			1-18-09	0910	502.12		
"	1428	502.08			1-18-09	1312	502.07		
"	1438	502.07			1-18-09	1704	502.02		
"	1448	502.06			1-18-09	2104	502.04		
"	1458	502.06			1-19-09	0100	502.05		
"	1528	502.06			1-19-09	0500	502.05		
"	1602	502.06			1-19-09	0918	502.12		
"	1628	502.05			1-19-09	1257	502.05		
"	1701	502.05							
"	1730	502.04							
"	1757	502.04							
"	1836	502.04							
"	1902	502.04							
"	1931	502.04							
"	2002	502.04							
"	2031	502.03							
"	2205	502.02							
"	2203	502.04							
"	2302	502.03							
1/17/09	2404	502.02							

Conversion Factors: 1 PSI = 2.31 feet

1 cubic foot = 7.48 gallons

AQUIFER TEST DATA SHEET (OBSERVATION WELLS)

Page 1 of 1

PROJECT NAME: KAFB PROJECT NO: 1971112 PIEZO NO: KAFB-0523
 DATE: 1/16/09 PUMP DEPTH: 574 ft TEST NO: Constant Rate
 TYPE OF TEST: AQ PUMPED WELL NO: KAFB-EX001 DISTANCE FROM PUMPING WELL: _____
 MEASURING EQUIPMENT: Water Level Indicator, Transducer HYDROGEOLOGIST: Rob Young

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On: Date/Time _____		Pretest Water Level: _____							
Pump Off: Date/Time _____		Static Water Level: _____							
Duration of Aquifer Test _____		Measuring Point: <u>Top of PVC casing</u>							
Pumping: _____		Elevation of Measuring Point: _____							
Recovery: _____									
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
1/16/09	1153	493.51			1/17/09	0108	493.42		
"	1310	493.48			"	0502	493.41		
"	1321	493.48			"	0909	493.47		
"	1331	493.48			"	1306	493.41		
"	1343	493.48			"	1707	493.40		
"	1354	493.48			"	2109	493.45		
"	1403	493.47			1/18/09	0106	493.48		
"	1413	493.47			1/18/09	0509	493.49		
"	1423	493.45			1-18-09	0916	493.56		
"	1434	493.44			1-18-09	1300	493.49		
"	1444	493.44			1-18-09	1658	493.42		
"	1454	493.44			1-18-09	2108	493.42		
"	1503	493.44			1-19-09	0104	493.45		
"	1533	493.44			1-19-09	0506	493.44		
"	1611	493.44			1-19-09	0914	493.52		
"	1637	493.44			1-19-09	1309	493.41		
"	1708	493.43							
"	1738	493.42							
"	1804	493.43							
"	1842	493.43							
"	1908	493.43							
"	1937	493.43							
"	2010	493.43							
"	2030	493.43							
"	2110	493.43							
"	2209	493.43							
"	2306	493.43							
1/17/09	2409	493.42							

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

**AQUIFER TEST DATA SHEET
(OBSERVATION WELLS)**

Page 1 of 1

PROJECT NAME: KAFB PROJECT NO: 1971112 PIEZO NO: KAFB-0508
 DATE: 1/16/09 PUMP DEPTH: 574ft TEST NO: Constant Rate
 TYPE OF TEST: AQ PUMPED WELL NO: KAFB-EXD01 DISTANCE FROM PUMPING WELL: _____
 MEASURING EQUIPMENT: water level indicator, Transducer HYDROGEOLOGIST: Rob Young

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On: Date/Time _____		Pretest Water Level: _____							
Pump Off: Date/Time _____		Static Water Level: _____							
Duration of Aquifer Test _____		Measuring Point: <u>Top of the metal casing</u>							
Pumping _____		Elevation of Measuring Point: _____							
Recovery: _____									
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
1/16/09	1200	498.81			1/17/09	0111	498.84		
	1310	498.80			"	0510	498.85		
	1320	498.83			"	0915	498.92		
	1330	498.84			"	1302	498.86		
	1340	498.83			"	1704	498.86		
	1350	498.85			"	2211	498.90		
	1400	498.85			1/18/09	0109	498.94		
	1410	498.86			1/18/09	0512	498.94		
	1420	498.86			"	0905	498.98		
	1430	498.86			"	1305	498.93		
	1440	498.86			1-18-09	1655	498.90		
	1450	498.86			1-18-09	2111	498.90		
	1500	498.87			1-19-09	0100	498.92		
	1530	498.87			1-19-09	0509	498.92		
	1612	498.81			1-19-09	0911	498.97		
	1641	498.83			1-19-09	1317	498.90		
	1712	498.82							
	1742	498.81							
	1806	498.83							
	1844	498.83							
	1912	498.83							
	1939	498.84							
	2013	498.84							
	2038	498.89							
	2113	498.84							
	2213	498.85							
	2310	498.85							
1/17/09	2412	498.84							

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

Page 1 of 1

[illegible]

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

AQUIFER TEST DATA SHEET (OBSERVATION WELLS)

Page 1 of 1

PROJECT NAME: KAFB PROJECT NO: 1991112 PIEZO NO: KAFB-0508
 DATE: 1-19-09 PUMP DEPTH: 574' TEST NO: RECOVERY
 TYPE OF TEST: AQ PUMPED WELL NO: 12X001 DISTANCE FROM PUMPING WELL: _____
 MEASURING EQUIPMENT: WLE, TRANSDUCER HYDROGEOLOGIST: _____

Time Data		Water Level Data			Time Data Continuation		Water Level Data Continuation		
Pump On: Date/Time		Pretest Water Level							
Pump Off: Date/Time		Static Water Level							
Duration of Aquifer Test		Measuring Point							
Pumping		Elevation of Measuring Point							
Recovery									
Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)	Date	Time	Depth to Water (ft)	Pressure Transducer (XD)	Flow Rate (gpm)
1-19-09	1404	498.88							
	1412	498.85							
	1418	498.83							
	1422	498.82							
	1430	498.81							
	1440	498.79							
	1450	498.78							
	1500	498.76							
	1510	498.76							
	1520	498.76							
	1530	498.76							
	1540	498.75							
	1550	498.75							
	1600	498.72							
	1630	498.70							
	1700	498.70							
	1728	498.69							
	1801	498.68							
	1908	498.64							
	1957	498.68							
	2058	498.66							
	2158	498.66							
1-20-09	1045	498.72							
1-20-09	2245	498.62							
1-21-09	1002	498.60							
1-21-09	No more hand measurements as of 1020 AM								

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

Page 1 of 1

PROJECT NAME: KAFB PROJECT NO: 197112 PIEZO NO: KAFB-0523
DATE: 1-19-09 PUMP DEPTH: 574' TEST NO: RECOVERY
TYPE OF TEST: AC PUMPED WELL NO: 12X-001 DISTANCE FROM PUMPING WELL: _____
MEASURING EQUIPMENT: WLI, Transducer HYDROGEOLOGIST: Rob Young

[illegible]

Conversion Factors: 1 PSI = 2.31 feet 1 cubic foot = 7.48 gallons

1-12-09

Sunny, windy

0800 @ KAFB Bading

0900 @ KAFB-ST105-EX001

DTW - 497.76'

DTB - 588.49'

Setting pump @ 574'
For Tests1030 TAKE Ins. to boxes back
to Hotel, go to Home
Depot, get Clamps &
locks for holdingTransducers in place.
The pump being 15 horse
8.5 gallon a minute pump
by WDECalled Rumsey informed
where here

Called Flightline

846-7706 Sgt Thomas Seimens
Previously Sgt Smith has
said it would be OKTo set up Camp Trailer.
1200 begin installing Transducers.

1-12-09 - Cont.

Sunny, windy

1200 @ KAFB-508

DTW - 498.70'

DTB - ~~506.00~~ 514.65'Set Transducer @ 505.15' in
1502' to 30' of H₂O above Transducer
Scheduled Test To Run every
10 minutes & To Start @
1500

1240 Move To KAFB-0507

DTW - 502.05'

DTB - 515.53'

Set Transducer @ 515.00'
with 13.00' of H₂O above
TransducerRaised & lowered to make
sure it's working, OK

1350 @ KAFB-0523

DTW - 493.42

DTB - Approximately 600'

Set Transducer 30' Below
Static Water level

1530 checked Test in 508

Transducer had slipped
pulled back up & marked
Cable with Sharpie

1-12-09 cont.

1530 Nick of WDC back
on site with straw &
plastic, begin building
erosion control

Nick went to Home Depot
for fittings

erosion control needs more
straw, will get tomorrow
WDC builds discharge fountain

1-13-09

Sunny, 37°

0900 clean up paperwork

1000 Front desk calls, transducer

here go to site install in

EX-001 DTW = 497.76

NTB = 588.49

Install transducer @ 563'

Pump was installed @

574.00'

Background started
@ 1210

1230. go clean out truck
get straw

1602 @ 507 Take DTW

DTW = 502.00' no slippage
of transducer cable.

1612 @ 523 Take DTW

DTW = 493.40

No slippage of transducer
cable

1615 @ 508 Take DTW

DTW = 498.66

No slippage of transducer
cable

over

1-13-09 Cont.

1620 @ EX-001 Take DTW
DTW = 497.60

small slippage of Transducer
Cable 1/8" inch maybe.

Finish putting out STRAW
for Erosion Control

1630 leave to go pick up
Camp Trailer in Rio Rancho

1930 back @ Hotel, done

1-14-09

Sunny, 45°

0900 leave for RPTB, go
set up Trailer, get

Supplies for Trailer
1200 called MARK Holmes

Informed him we're
ready for inspection
He & Chris will come
out between 2-3 pm for
a look

1310 @ 0507 DTW- 503.01

No slippage, downloaded Test
Manual Readings Taken from
Top of PVC Pump Top opening

1330 @ 0523 DTW- 493.34

download Test, Manual
Readings Taken from Top
of Inner Well Casing @ MARK
download BARD Trail
data

1340 @ 0508 DTW- 498.66

No slippage, Manual Readings
Taken from Top of Outer
Steel Casing @ MARK

OVER

1-14-09 Cont.

1400 @ EX-001 DTW-497.54
No slippage, download
Test, Manual Taken from
Top of Steel Casing @
locking Tab.

1430 MARK Holmes & Chris
Sequre @ Site for
Inspection.

Initial Meter Readings

Total digital 0
Analog 475558

1-15-09

0700 Go to Truman gate
get Rob A PASS, then drop
him off @ Louisa Urgent
Care as he's sick, doing
step tests alone.

0830 shutdown background
on pumping well DTW-497.65'
turned on pump filled piping
with H₂O set flow @ 159pm

0910 @ 507 DTW-500.08

Stopped Background Test

Set up step in 507

Test to begin @ 0920

0930 @ 523 DTW-493.47

shutdown & download

523 background, start step

@ 940 download Baro background

start Baro step. 940

0940 @ 508 DTW-498.70

shutdown & download background

start step start @ 950

947 @ EX001, set up transducer

for first step @ 159pm

159pm step not working

Tried twice draws down 2'

Then Flow slows down about 39pm
over

1-15-09 Cont.

and H₂O level starts climbing
 TALKED with Doug - were
 skipping the 15gpm step
 START @ 25gpm,
 started 25gpm Test @ 1220
 working much better
 1340 Called Doug gave him
 #'s, He said to do next
 step @ 40gpm

1400 MARK Holmes visited
 site, watched as we started
 next step @ 40gpm

1630 - TALKED with Doug
 he says go to 60gpm
 60gpm test will start @
 1650

1500 TALKED with
 Doug He wants us to
 pull the 1" pipe &
 see what we get
 with STRAIT 2" pipe
 after this test

1710 START Test with
 all 2" pipe
 only manuals every
 5 minutes

1-15-09 Cont.

calculating flow with
 Analog Meter

1-16-09

0830 leave for KAFB

0900 @ Pump Test Site

1030 Doug Called, Said
To Run Constant Rate Test
@ 539pm, Called Nick
To Come To Site1130 Went to All Observation Sites
downloaded Tests, scheduled
Constant Rate Tests to
START @ 1300,

1300 Constant Rate Test

STARTED @ 52.99 gpm,
drew down approx 6'STabilized flow @ 52.50
gallons per minute.

TAKING ALL MANUAL Readings

1530 Rob leaves Site will
be back @ 20001800 TOOK TOTALIZER Readings
Digital - 32,193

Analog - 507685

2000 Rob on Site, Hector
of WDC
Continue Readings

1-17-09

Sunny, Mild

0800 Dennis & Nick back
on Site, Rob & Hector
leave, WDC Filled Generator
with Diesel0900 go Take readings &
download data

1300 Take Readings

1700 Take Readings

2000 Rob & Hector on Site

Dennis & Nick leave Site

2100 Rob Takes Readings

2400 Still on Site

1-18-09 Sunny, 55°
 0100 Rob Takes Readings
 0500 Rob Takes Readings
 0800 Dennis & Nick back on site, Rob & Hector leave
 0900 Dennis Takes Readings
 1300 Take Reading, download Transducers
 1700 Take Readings
 2000 Rob & Hector Back on site, Nick & Dennis leave
 2100 Rob Took Readings

1-19-09 Sunny, 32-58°
 0100 Rob Took Readings
 0500 Rob Took Readings
 0800 Dennis & Nick back on site, Rob & Hector leave
 0900 Dennis Took Readings
 1300 Dennis Took Readings & prepared for shut down, Recovery Test Rob back on site for first 2-3 hrs of Recovery Test.
 1400 Recovery Test Starts
 Rapid manual, 1600 Rob done ready to leave site
 1700 After Talking with Doug & he talked with Deb & it was determined because Recovery was so rapid we could shorten manual Reading 1/2 hrs to 6, then 1 hr to 10, the 12 hr. Readings

1-20-09

Sunny

Took 10AM Readings

hook up to Camp trailer

Return to Pioneer Rentals

Total Cost with Generator

should be \$987.03

10PM Went to Take 12 hour

Reading, was detained

by Security as an

operation had occurred

And I did not see

The plane in the dark

eventually got readings

& left site

4 hrs

1-21-09

Sunny

10AM Went to Site to

get 12 hour Readings

Pub called, Wells not

Secured, will fix

Doug called said to take

no more manual Readings

talked about tomorrow

will do step tests &

cleanup.

Will go back on site

in 4 hr after plane

leaves as Kumsco is

not allowing access

to pad 5.

4 hrs.

Sunny, 37.57°

1-22-09

0800 @ Site waiting for word
on larger pump or not
Get land fill permit
Meet WRC @ EX-001, Begin
pulling pump.

0900 Stopped just in EX-001
Pulled Transducer

DTW = 497.43

1120 Pump out of well, waiting
to hear if we have permission
to proceed with larger pump
1130 WRC leaves site to go
do other stuff

1-23-09

0730 Leave for Site, go to
Contractors yard drop off
Boxes & some equipment
1x 4x Small table, 2 buckets,
100' extension cord,

0900 Talked with pet
Adrian has received the
request, clean up ship
transducers, leave site.

WRC on site from 0900 to
1200 cleaning straw, etc.

(plastic, misc. equipment.)
Dennis to finish pulling
transducers & ship to
Institute. go to Contractors
yard get boxes

Called James of Annotek
informed him he will
not be needed.

1530 done @ FedEx, all
equipment returned to
Institute, 2 will have
damage.

MA

1

ATTACHMENT B

KAFB LANDFILL PERMIT FOR IDW DISPOSAL

KIRTLAND AFB LANDFILL SHORT-TERM PASS

(TEMPORARY, LESS THAN 90 DAYS)

AFC

PASS NUMBER

DATE ISSUED:

T 920

22 Jan 09

VALID:

FROM: 22 Jan 09

TO: 31 Jan 09

CONTRACTOR

CONTRACT NUMBER

VEHICLE LICENSE NUMBER

MWH Americans Inc

FA8903-08-D-8777

Z286DZ

377 ABW/EM REPRESENTATIVE

Cindy

6-6704

ATTACHMENT C

KAFB GROUNDWATER DISCHARGE AUTHORIZATION

Deborah Carter-Drain

Subject: FW: Final Aquifer Test Work Plan

-----Original Message-----

From: Segura, Christopher G Civ USAF AFMC 377 MSG/CEANC
Sent: Friday, January 09, 2009 1:06 PM
To: Holmes, Mark D Civ USAF AFMC 377 MSG/CEANR
Cc: Crosgrove, Cole G Civ USAF AFMC 377 MSG/CEANC
Subject: FW: Final Aquifer Test Work Plan

Mark,

I see no issue with this proposed discharge provided that nitrate+nitrite concentrations in the discharge water be less than the New Mexico Water Quality Standards for Interstate and Intrastate Surface Waters; Irrigation, Livestock Watering, and Wildlife Habitat Uses, 20.6.4.900J NMAC standard of 132 mg/L.

Thank you,

Christopher G. Segura
Water Quality Program Manager
Natural Resources Management Branch
Kirtland AFB, NM 87117
505-853-5443, DSN 263-5443
Christopher.Segura@Kirtland.af.mil

-----Original Message-----

From: Holmes, Mark D Civ USAF AFMC 377 MSG/CEANR
Sent: Wednesday, December 17, 2008 10:15 AM
To: Segura, Christopher G Civ USAF AFMC 377 MSG/CEANC
Subject: FW: Final Aquifer Test Work Plan

Chris

Attached is the workplan for conducting the aquifer test on the groundwater extraction well. Again, we anticipate production of 200,000-400,000 gallons of water that will be discharged in the watercourse that receives any discharge from production well KAFB 7. We ensure that the discharge does not cause surface erosion and construct sediment barriers (hay bales) along the watercourse. Pat processed this under the NPDES permit, with the main criteria being to meet certain standards stated in the workplan.

The attached workplan is being revised to change the anticipated volume of water, replace Pat's name with yours, and include a lab report to substantiate the nitrate concentration detected in the plume in which the extraction well is installed; I will forward the revised workplan to you this week, but am sending this now for your initial review.

Thanks

//Signed//

Mark Holmes

Project Manager

Environmental Management

Restoration Section

505 846-9005

From: Deborah C Drain [mailto:Deborah.C.Drain@us.mwhglobal.com]
Sent: Friday, December 05, 2008 4:15 PM
To: Holmes, Mark D Civ USAF AFMC 377 MSG/CEANR
Subject: Final Aquifer Test Work Plan

Mark,

Attached is the final aquifer test work plan. If you are good with this version, all we will need is the transmittal letter and the signed document certification form.

Deb